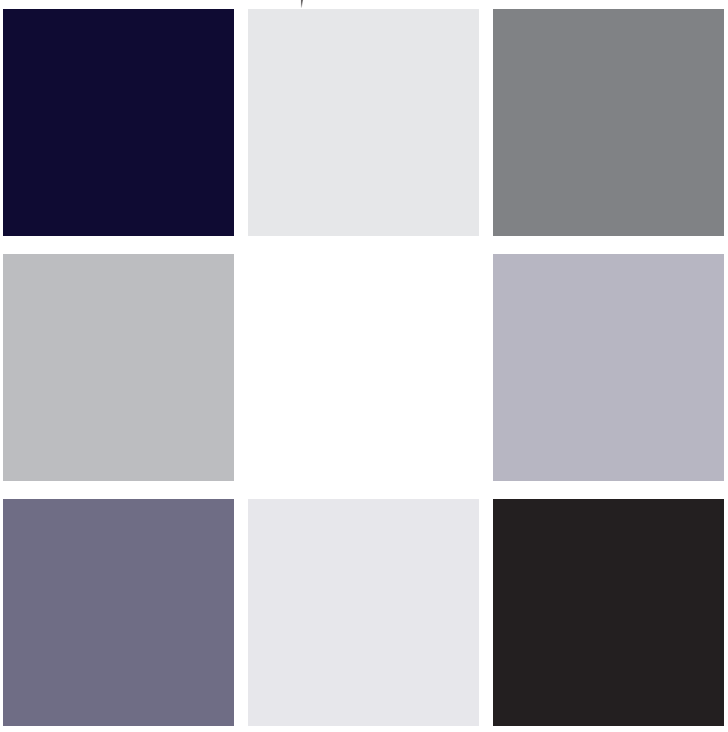
# A BENEFIT-COST ANALYSIS OF CITY CONNECTS

2015



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Benefit-cost analysis, comprehensive student support, student support services, school and community partnerships, learning support

—Resources, such as teacher time, that were utilized in a particular implementation at a specific time with a specified group of students. The ingredients are described, quantified, and matched with prices to estimate the total cost to replicate the implementation of the program.

—The core costs of City Connects comprises the monetary value of all ingredients utilized in providing the City Connects program, including the School Site Coordinator, school staff and materials, parental time, and City Connects Central Program Staff. These costs exclude external services, such as those provided by the community partners.

City Connects matches each child in a school with tailored services that can benefit the growth and development of the child, some of which were provided by external community organizations or community partners. The costs of these community partners were evaluated to understand which should be allocated to estimates of the total cost to replicate the impacts of City Connects.

—The total cost of City Connects is the monetary value of all resources required to replicate the intervention, whether provided by City Connects or a community partner program. Due to the complexity of the program and the relationship between City Connects and the community partners, the total cost of City Connects is explored in three models. The preferred specification is the third model, which includes a portion of the costs of community partner services in the estimate of the total cost of City Connects.

The costs of City Connects are financed (or provided in-kind) by the City Connects central program office, the school system, and the parents of participating children. This report distinguishes among the costs (or ingredients) utilized in implementing the program and who bore the costs. The financial burden for each party is indicated as the costs to the school, the costs to City Connects, and the costs to parents.

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program's impact is a result of both the resources and services provided directly by City Connects as well as services provided by community partners. This study examines the costs of the City Connects program at two school sites in the Boston Public Schools as well as a sample of services provided to students by community partner organizations serving each school.

Although there are a range of programs that link school children to comprehensive services in schools and communities, none have undertaken rigorous studies of their costs or benefits that account for the complexity of the relationship between the program (City Connects in this example) and the service providers. For this reason, this work also addresses methodological issues in estimating the cost to replicate the measured impacts, whether they are related directly to City Connects activities or through partnerships with community organizations. Based on the results of this preliminary study, we will explore extending the analysis to a larger study that would further investigate the costs of City Connects and community partner services.

Future research could benefit from an examination of the literature on the effects and costs of similar programs that focus on providing services for the whole child within schools that utilize services available in the community. Accordingly, this study provides the first effort in that direction for City Connects and a model that might be applied to other programs with similar goals. In the following section, City Connects is described and the methods and results of this analysis are provided.

# 2. CITY CONNECTS: DESCRIBING THE PROGRAM

# 3. METHODS

## 3.1

1. What are the core costs of City Connects?
2. How are the core costs of City Connects distributed across the central program office, schools, and parents?
3. What is the cost of Community Partner services, on average?
4. What is the total cost and cost per student of City Connects? How does this estimate change when assumptions regarding the relationship between the program, the schools, and the community partners are altered?
5. What are the monetary values of the social benefits produced by City Connects through improvement

time at the 2013 rate of minimum wage in Boston. Facilities costs were estimated by multiplying the square footage used by an annualized cost for new construction that included land acquisition and furnishings.

Materials were matched with prices available via online sources. For instance, the cost for a portable dental unit utilized by one community partner specializing in providing dental care was estimated using the Dental Chair Surgical Chair Complete Package, at the price of $3,699.99 per set.[3]

If necessary, prices were adjusted for inflation using the Consumer Price Index calculator available online (http://data.bls.gov/cgi-bin/cpicalc.pl). Additionally, since the program took place over six years, costs and benefits are expressed as a present value at the time of kindergarten using a 3.5% discount rate.

## 3.5

In a benefit-cost analysis, costs must account for the resources used to produce the impacts of the program. It is uncertain how much of the impact of City Connects is due to the resources of the City Connects program or the specific resources provided through community partner services In this study, the total costs to replicate the impact are reported as the core costs of City Connects both without and with the estimated costs of community partner services provided to students, reflecting this uncertainty.

In what follows, the costs of City Connects are described using three terms for clarity: core costs of City Connects, costs of community partners, and total cost of City Connects (see Glossary for further description). The core cost of City Connects is the monetary value of all ingredients used to implement City Connects, excluding community partner services. The costs of community partners provides information about the services and resources available to students through these external organizations. The total cost of City Connects is explored through three models to account for the relationship between community partner services and the impacts of City Connects.

### 3.5.1 C , C , C , C

The core costs of City Connects include the School Site Coordinators (SSCs); the time devoted to the program by teachers, principals, guidance counselors, and other school staff; materials and facilities utilized in implementing the program; parental time; and the time contributed by City Connects Central Program Staff for training and implementation. These ingredients are incremental to the normal business of schools where the City Connects program is not present.

The central City Connects program, the schools, and students' parents finance the core costs of City Connects by paying directly for the ingredients or contributing them in kind. Therefore, the analysis of the core costs of City Connects will also include an examination of who pays for the program. Understanding how the costs are financed is especially important for school or district decisionmakers because it outlines the costs borne by the school separately from those borne by other entities.

3 http://www.amazon.com/ In a sensitivity analysis, we amortized the cost of the dental package over 5 years using 3.5% discount rate. Amortization reduced per student cost for the dental service by $13, but amortization did not affect the per student cost of City Connects estimates under models 2 and 3.

### 3.5.2 C , , P , , C

By design, one of the main functions of the City Connects program is connecting schools and students

in and sometimes led their school's Student Support Team meetings. While the City Connects staff time spent in this meeting is captured in the core costs, the meeting is a standard practice in all BPS schools ("business as usual"). Thus, the total time of other school staff members attending the meeting are not included in the main analyses presented here. A sensitivity analysis is provided in Appendix I: Technical Appendix that includes the costs of other personnel who attended the Student Support Team meetings, such as school psychologists, teachers, principals, nurses, and occasional community agency staff members. This test explores the possibility of the contribution of this meeting to the effectiveness of City Connects either through additional time for collaboration or additional time to discuss student needs or progress.

*C . C C M .* 1. Model 1 is a lower bound estimate that assumes that students in comparison schools receive equal amounts of services from community partners as students in City Connects schools. Thus, the only costs to replicate the implementation would be those included in the core City Connects costs. Implicitly, any program effects would be due solely to the City Connects program, likely through better identification of service need and better matching of services to students.

There is some empirical support for the assumption that overall levels of resources invested in services amongst community partner organizations are similar across treatment and comparison schools. Interviewees at several of the community partners indicated that the programs served similar numbers of students at City Connects sites and other schools in Boston, or that the program served similar numbers of students at the school sites before City Connects was affiliated with the school. Further, several partner services have very low variable costs relative to their fixed costs, implying that the marginal cost of serving one additional student is minimal.

However, it is possible that differences in outcomes between the treatment and comparison schools soMC /Span <</MCID 42uenttETEMC /SpTjETEMC e1c23business (, usost.1c211 at span :5(sCID2 Twelativeattribulhe

Table 4 presents the discounted total and per student costs at kindergarten for community partners, extrapolated from the sampled partner costs, at two school sites. Please see the Technical Appendix for details on the extrapolation procedure. On average, the services cost $7,530 per student for six years of program participation. However, large variations existed among sites in terms of per student cost, largely due to differences in the types of services provided. These differences may be the result of sampling at two levels—school sites and community partners within sites. In general, services that involved frequent one-on-one tutoring or mentoring, with frequent sessions, cost the most per student, especially those that used designated space for the services. Although some partners that provided health services seem to be costly, they did not necessarily yield high costs per student because these services were delivered less frequently. Partners that specialize in providing materials also had low per student cost, as result of the large number of students served.

In the next section, we explore three models of calculating the costs of City Connects based on the costs presented above. Note some schools provided services in addition to those provided by City Connects and the community partners. Because most schools are likely to provide those services regardless of the presence of City Connects, we did not consider those costs to be incremental. Therefore, the models below illustrate the core costs of City Connects, City Connects plus estimates of all community partner costs, and City Connects plus estimates of incremental community partner costs.

### 4.4 [illegible] 1, 2, & 3

Table 5 presents results of the three cost models. Under Model 1, the present value cost of City Connects at kindergarten is $1,540 per student for six years of participation. The results for Model 1 are considered to be lower-bound estimates of the overall program costs because Model 1 only includes the core costs of City Connects (no community partner services included). The underlying assumption is that community partners provided services equally to schools that participated in City Connects and those that did not. In this scenario, the cost to replicate the impact of City Connects is represented by the core costs of the program and greater efficiency in screening and program matching of City Connects than in comparison schools.

The present value cost per student under Model 2 is $9,070 for six years of participation. Model 2 is an upper-bound estimate of the total cost of City Connects as it includes all costs of community partners. This model assumes that only the schools in the treatment group received services from community partners and as a result all community partner costs must be considered to replicate the impact of the program. This model may be important for policymakers in locations considering City Connects where community partners do not exist or where schools themselves would have to cover the costs of services of community partners.

Model 3 provides the intermediate estimate of $4,570 per student for six years of participation. Model 3 includes the core costs of City Connects plus a portion of community partner costs to reflect that some community partner services were provided only to City Connects schools or City Connects schools were preferred partners due to the involvement of City Connects. Thus, these community partner costs must be included to estimate the cost to replicate the impacts of City Connects.

As an intermediate estimate, Model 3 is the preferred specification, which was supported in interviews with community partners. However, this model is not without limitations. The assumptions are explored in more detail in Appendix I: Technical Appendix. In what follows, the cost per student from Model 3 ($4,570) is compared to the per-student benefits of the program, discussed in the next sub-section.

evidence). That gain represents the cognitive score increase necessary for the program to 'break even'. As another example, looking only at high school graduation, the benefits of City Connects equal the costs until the yield of new graduates falls to 2 per 100 City Connects participants. That is, if the program improves the high school graduation rate by only 3 percentage points, it will break-even (relative to the research evidence showing a 7 percentage point advantage). That is, City Connects might still be half as effective and still break even.

# 5. DISCUSSION AND NEXT STEPS

These benefit-cost results are substantial and can be summarized for each class cohort of students. We assume an entry cohort of 100 kindergarten students into a new school in 2014. For that cohort the total cost of City Connects would be $457,000 over their years in that school. The social benefits of City Connects would amount to $1,385,000. Thus, the benefits of City Connects from society's perspective significantly exceed the costs by about $928,000.

This preliminary analysis provides strong evidence that the benefits of City Connects exceed the costs, even under the most conservative assumptions and models. In addition to the benefits associated with increased education attainment and achievement, City Connects may also benefit society

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# FIGURES AND TABLES

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**2**

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|---|---|---|
| **$1,540** | **15 0** | **$2,40 ,540** |

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3

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|---|---|---|---|
| | $1,204,5 0 | $1,0 ,4 0 | $122,0 0 | $4, 0 |

4

| 1 | 2 |
|---|---|

5

| 1 | 2 | 3 |
|---|---|---|
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# 1. INGREDIENTS AND PRICING FOR CITY CONNECTS AND COMMUNITY PARTNERS

The cost analysis of this study followed the ingredients method. Total costs of the program were first broken down into four categories: personnel, materials, facilities, and other. Then specific ingredients used by schools, the City Connects central office, and community partners were identified during site visits in June 2014 and subsequent telephone interviews. Researchers interviewed the City Connects administrative team at Boston College and school staff and City Connects school site coordinators at two sampled school sites, as well as representatives from a sample of community partners. Finally, the market price for each ingredient was obtained from the United States Bureau of Labor Statistics for personnel and online sources for other ingredients. To emulate program replication, the study used market prices. This is because the relevant cost metric is the market cost of obtaining particular ingredient of comparable quality for replication.

Prices were converted to 2013 dollars for consistency.

## 1.1

### 1.1.1 P

### C C A

The cost of time for City Connects central staff at Boston College was included to the extent that central staff activities related to implementation of the City Connects program at the school level. Costs were divided across City Connects school sites, weighted roughly by student population by apportioning costs according to the number of SSCs at each school. All the assumptions about the workloads have been reviewed by Boston College staff.

The oversees the City Connects program. This position was matched with a market price of $105,140, which is the mean annual salary for a postsecondary administrator in Boston in 2013, according to BLS. Based on communication with City Connects, we assign 20% of the Executive Director's time to program implementation. The director oversees 30 School Site Coordinators (SSCs) in total. To calculate the share of the portion of the director's work that contributed to the program in the two schools included in the sample, 20% is divided by 30 to get the per SSC cost. That figure is multiplied by 2 to get the site level cost (both sites have 2 SSCs). By utilizing the number of SSCs rather than sites, the cost is weighted by enrollment, given that the SSC to student ratio is 1:400.

School staff involved in program implementation at schools sites includes principals, assistant principals, and classroom teachers. The principals and assistant principals at the two sites had different involvement in the program. At one site, only one of the two assistant principals actively worked with the City Connects school site coordinators. We assume the principal's salary to be around $98,420,

wage in 2013 ($8.00/hour), whereas for college graduates and professionals, we used the average wage for persons with a bachelor's degree ($29.08/hour).[14]

to City Connects schools, respectively, then the total cost for these partners should be (100%A + 0%B + 30%C + 40%D + 50%E). This weighted sum of sampled partners' cost will be extrapolated to total costs for all partners by dividing it by 40%, which is the share of services for the sample partners together.

Again, note that the extrapolation relies heavily on the assumption that sampled partners are representative in terms of their costs, particularly the percentage of incremental cost. The share of costs that are incremental ranges from 0% to 100% across partners at both sites. The average share of service costs that are incremental across partners, weighted by the amount and cost of services, is 70% at Site 1 and 32% at Site 2.

# 3. ESTIMATING THE TOTAL COST OF CITY CONNECTS: FORMAL ASSUMPTIONS OF MODELS 1, 2, & 3

Formal assumptions associated with each of the three models used to estimate the total incremental cost of City Connects are provided below to conceptualize how the models address differences in changes over time between treatment and comparison schools in service costs.

Definitions:

C

incremental cost of City Connects becomes the sum of the core cost and the service cost of treatment schools after City Connects.

(4) $(C_{T1} - C_{T0}) - (C_{C1} - C_{C0}) = C_{T1}$
(5) City Connects = Core Cost + $C_{T1}$

Equation (4) can be rearranged algebraically into:

(6) $C_{C1} - C_{C0} + C_{T0} = 0$

In words, Equation (6) states that any changes in the comparison schools are offset by pre-existing services at the treatment schools. The simplest case in which this would occur is when there are no services at comparison schools (before or after City Connects), and no services before treatment at

# 4. SENSITIVITY TESTING

Appendix Table A1 below lists the results of sensitivity testing for costs, benefits, Net Present Value, and the benefit-cost ratio.

## 4.1

The cost estimates rely on two shadow prices for ingredients that were varied in sensitivity testing. The first sensitivity analysis of costs involved the inclusion or exclusion of school staff's time spent on Student Support Team meetings. The Student Support Team meetings were an existing school activity that usually included school psychologists, teachers, principals, nurses, and occasional community agency staff members. This meeting was led by or attended in part by the SSCs from City Connects. The school staff time for this meeting was not included in the main analysis because the Student Support Team is a standard practice in BPS. Therefore, the Student Support Team was not included as an incremental cost of City Connects. However, considering that part of City Connects' effectiveness derives from improving the efficiency of student support work, City Connects schools may utilize Student Support Teams more than other schools. If City Connects were implemented in school districts where student support teams are not prevalent, including the school staff time spend on Student Support Team meetings may be more appropriate and conservative.

The second sensitivity analysis of costs used an alternative price for volunteer time. In the main analysis, volunteer time was valued according to the task performed (teaching assistant). The sensitivity analysis uses volunteers' educational and professional background to estimate a shadow price for their time (i.e. minimum wage for high school/college students and senior volunteers, average salary for college graduates). Pricing volunteer time according to the qualifications and experience of the volunteers resulted in a lower price for the time because a large proportion of volunteers were priced at minimum wage. This sensitivity analysis may reflect differences in volunteer quality that could have contributed to the effects.

## 4.2

As discussed in the main text, the benefits ranged from $9,490 to $18,220 per student. If those values are paired with the total cost estimates from cost models 1 and 2, an upper and lower bound can be estimated for the program. The upper bound, or optimistic scenario, utilizes the lowest cost from model 1 and the highest benefits from attainment. The benefit-cost analysis results are very large with a Net Present Value of $16,680 and a benefit-cost ratio of 11.8. The lower bound utilized the highest result from a sensitivity test of total costs from model 2 and the benefits from achievement only. This test produced results very close to the break-even analysis where the benefits are nearly equal to the costs. These range estimates indicate that the benefit-cost ratio is almost certain to exceed 1.

**A1**

**A**

| Total Cost of City Connects (PV) | Per Student |
|---|---|
| **( 3)** | **$4,5 0** |
| *B* **(A )** | **$13, 50** |
| *N P, (B -C )* | **$ ,2 0** |
| *B C R* | **3.0** |

# 5. INTERVIEW PROTOCOL

To the interviewer: This document will serve as a guide for you to conduct interviews with individuals affiliated with programs and evaluations included in our study. Some of the interviews will be iterative, meaning that you will develop additional questions as you obtain answers to the questions suggested below. Please take clear notes and be sure to be kind and considerate. Smile! It will come through in your voice.

**Opening Questions**

Please describe how the program operates generally. What kinds of services are provided? Where are these services taking place? How are participants referred to the program?

We show that XX students were served at XXX school. How many schools and students were served by the program in total? How many were served through City Connects?

Do you serve other BPS schools? Have you historically been involved with schools or did the relationship begin with City Connects?

Did you modify the process to accommodate City Connects and XXX school specifically?

**Personnel**

The questions listed below are intended to gather detailed data on personnel. We are interested in any personnel involved in the program—planning, implementing (i.e. actually delivering the services), supervising, volunteering.

Director (ask for all additional personnel based on description of program)

- What was the director's role in the program? (meetings, professional development, scheduling, etc.) How much of the individual's time was spent on the program last year?
- What were the director's qualifications? (e.g., degree, years of experience) Is the director on staff full-time and does the position include benefits?

Other community partner personnel

- What was the individual's qualification? (e.g., degree, years of experience)
- How was he/she recruited? What training did he/she receive? How many times per week did he/she come to the school? About how much time per week did he/she spend on the program? How long

**Facilities**

- What space was utilized by the program? How often? About how large? Was the space devoted to the program?
- Did the space include any computers or other technology used by the program?

**Other questions**

- Did the program involve any travel or transportation reimbursement for personnel or students?
- Did the program require any inputs from students' families? For example, how often do parents come to attend workshops and other parent involvement activities? id the program charge any fees to the participants? Or does the school or city connects provide funding for the program?
- Were there any other aspects of the program—including resources paid for by the school and other donated goods and services—that we haven't covered? (For example, was there a party or end of year celebration?)
- Is there anyone else we should contact in your organization who might be able to give us further information about the ingredients and costs of implementing the program?